EXHIBIT A

One Shot Process

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Bühler Bindler

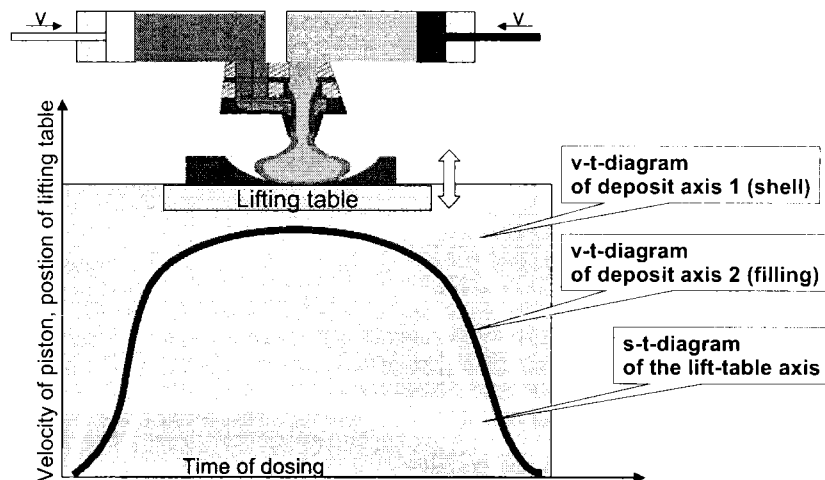**C BUHLER**

One shot process

Shell mass piston   Filling mass piston
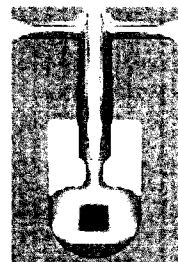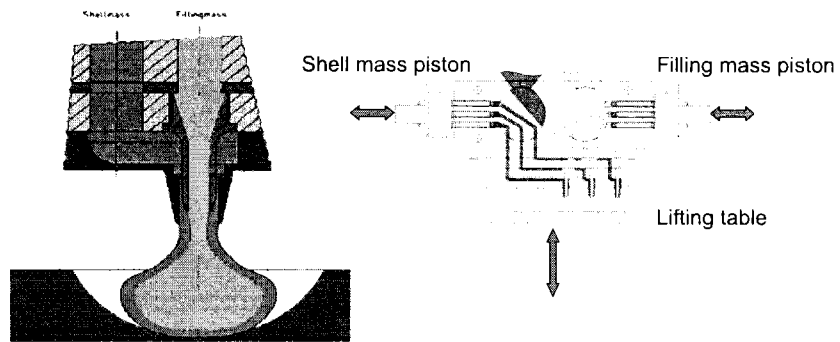
Lifting table

Movement of pistons and lifting table allows to form product in one shot
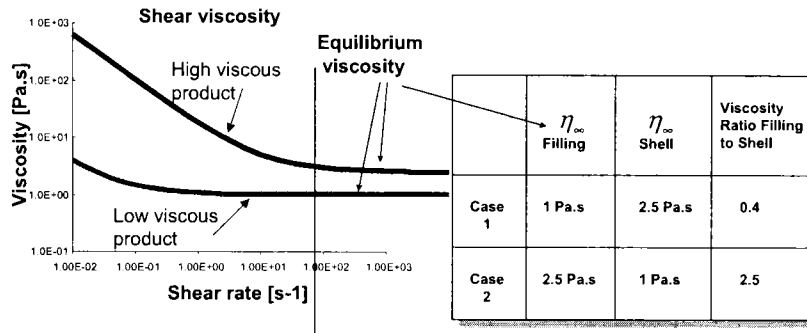Product properties of shell and filling mass are key for one shot

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Example of dosing profile
Typical ONE SHOT- curves

v-t-diagram
of deposit axis 1 (shell)

v-t-diagram
of deposit axis 2 (filling)

s-t-diagram
of the lift-table axis

Velocity of piston, postion of lifting table

Lifting table

Time of dosing

Range of Viscosities applied for Numerical Simulation
Different type of flow functions used for shell and for center filling

Shear viscosity

Viscosity [Pa.s] axis: 1.0E+03, 1.0E+02, 1.0E+01, 1.0E+00, 1.0E-01

High viscous product

Equilibrium viscosity

Low viscous product

Shear rate [s-1]: 1.00E-02, 1.00E-01, 1.00E+00, 1.00E+01, 1.00E+02, 1.00E+03

	η_∞ Filling	η_∞ Shell	Viscosity Ratio Filling to Shell
Case 1	1 Pa.s	2.5 Pa.s	0.4
Case 2	2.5 Pa.s	1 Pa.s	2.5

Numerical Simulations should reveal differences by testing extremes
- high viscous shell or filling – low viscous filling or shell

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Modelling of One Shot Process
Simulating influence of different product viscosity

Actual profile

Filling

Shell

Centre = 4mm

Outer D = 7mm

Cavity / Mould half sphere D = 20mm

Dosing Velocity – Simple Velocity Profile

Velocity of Piston or Product

Shell

Time

Centre filling

Profile used for simulation

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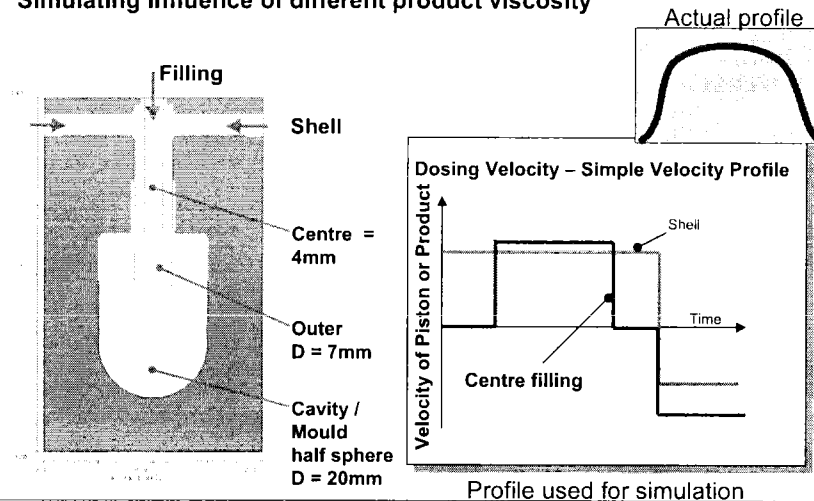
Effects seen in Numerical Simulation
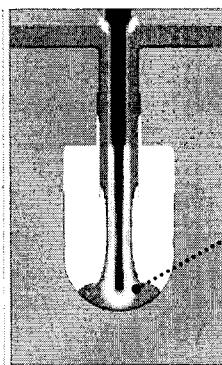## Comparison of case 1 and 2 - Start of dosing

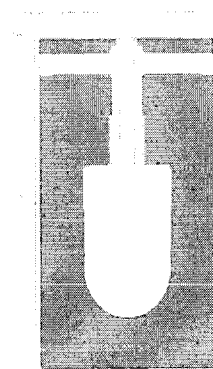**Case 1**
Shell high viscous
Filling low viscous / Ratio < 1

Case 2
Shell low viscous
Filling high viscous / Ratio > 1
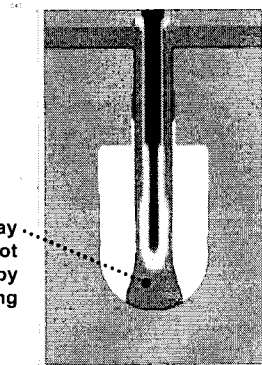
Shell is okay
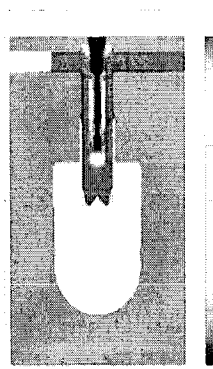and not
displaced by
centre filling

Already in the
beginning shell
is displaced by
the centre
filling

Case 1
Shell high viscous
Filling low viscous / Ratio < 1
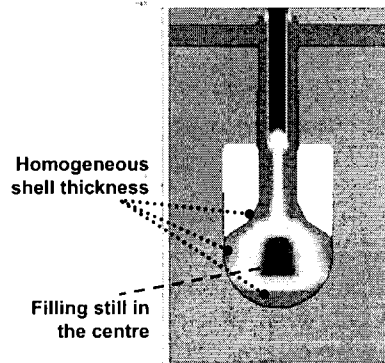
Case 2
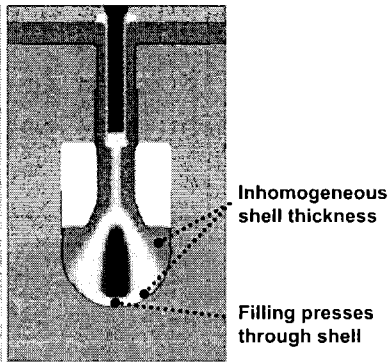Shell low viscous
Filling high viscous / Ratio > 1

Effects seen in Numerical Simulation

Comparison of case 1 and 2 — End of dosing after 1200ms

Case 1: Shell high viscous
Filling low viscous / Ratio < 1

Case 2: Shell low viscous
Filling high viscous / Ratio > 1

Homogeneous
shell thickness

Inhomogeneous
shell thickness

Filling still in
the centre

Filling presses
through shell

Red = shell, Blue = filling, all other colours show different degrees of mixture of both
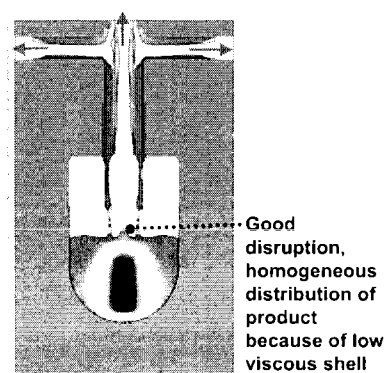

Effects seen in Numerical Simulation

End of filling, pull back of product after 1700ms

Case 1: Shell high viscous
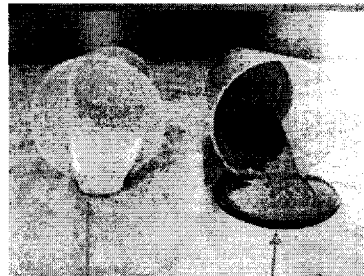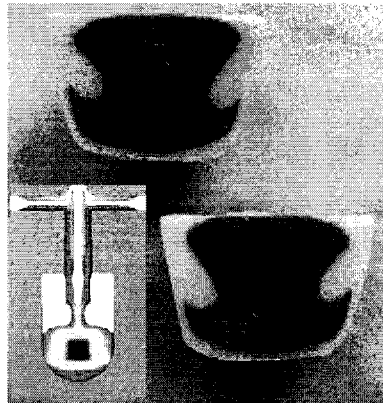Filling low viscous / Ratio < 1
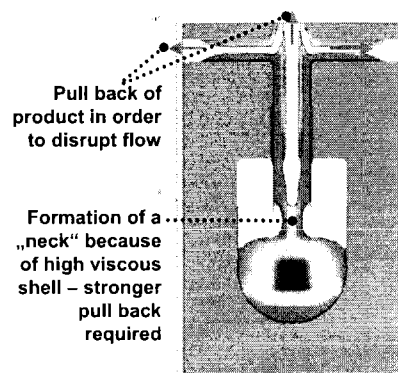
Case 2: Shell low viscous
Filling high viscous / Ratio > 1

Pull back of
product in order
to disrupt flow

Formation of a
„neck" because
of high viscous
shell – stronger
pull back
required

Good
disruption,
homogeneous
distribution of
product
because of low
viscous shell

Effects seen in practice
(Case 1)

Shell viscous

Filling low viscous

Shell mass   *Filling mass*

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Effects seen in practice
(Case 2)

Shell low viscous

Filling high viscous

Shell mass   *Filling mass*

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Effects seen in practice

Shell and filling have nearly the same viscosity
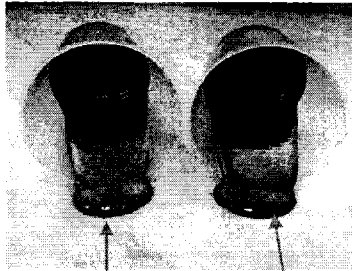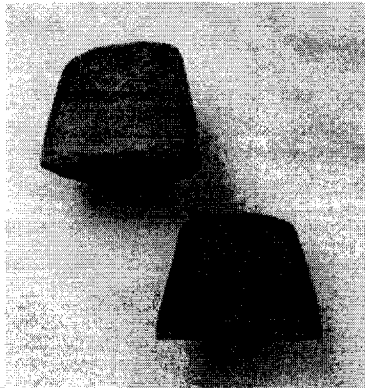
Filling mass   *Shell mass*

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Range of Shear Rates and Viscosities
Beginning of dosing

Case 1
Shell high viscous / Filling low viscous - Ratio < 1
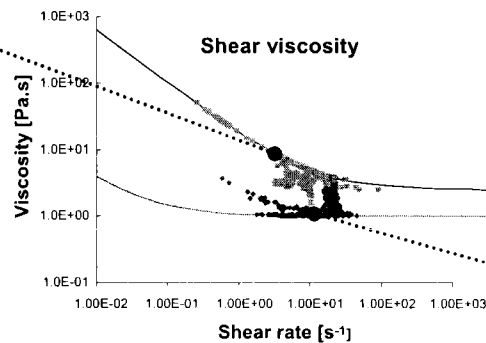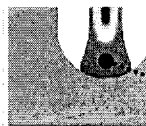
Shear viscosity

Case 2
**Shell low viscous
Filling high
viscous
Ratio > 1**

Viscosity [Pa.s]

1.0E+03
1.0E+02
1.0E+01
1.0E+00
1.0E-01

1.00E-02   1.00E-01   1.00E+00   1.00E+01   1.00E+02   1.00E+03
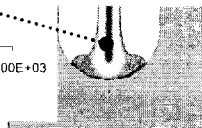
Shear rate [s⁻¹]

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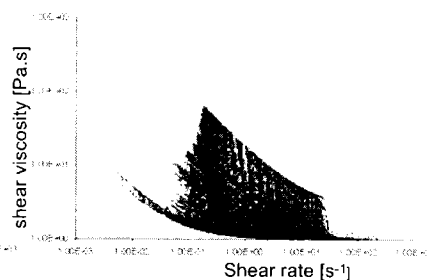# Range of shear rates during dosing process

Case 1
**Shell high viscous
Filling low viscous / Ratio < 1**
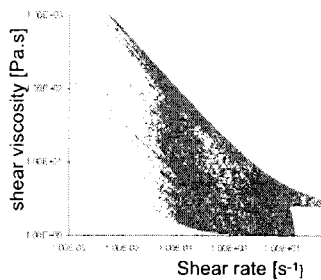
Case 2
**Shell low viscous
Filling high viscous / Ratio > 1**

**Most important for process is flow behavior
in the low shear rate domain, i.e. < 50 1/s**

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Conclusion of these Results & Future aspects

- Viscosity of products is key for One shot process

- Based on numerical simulation and coupling with physical data (viscosity curves) one shot process can be modeled

- Modelling allows to predict if the process will deliver a „good" or "bad" product

- Modelling will allow to simplify adjustments of the One shot process

- Modelling will allow to optimize the One shot process according to the needs

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